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Description

Authentication of key devices

5 The invention relates to a method as claimed in the precharacterizing clause of patent claim 1.

Such a method is described in principle in the book by W. Fumy and H.P. Rieß: Kryptographie, Entwurf und Analyse symmetrischer Kryptosysteme [Cryptography,

10 Design and Analysis of Symmetrical Cryptosystems] R. Oldenbourg Verlag, Munich Vienna, 1988, ISBN 3-486-20868-3.

When voice or, in general, data are transmitted in encrypted form, both communication partners must 15 have a joint secret, the keyword. This keyword is unknown to a potential eavesdropper or enemy. One option for this is an asymmetric encryption method, in which random numbers are interchanged between the communication partners, and are used to form joint 20 keywords.

With this method, it is impossible to determine whether the encrypted link is being set up with the desired communication partner, or with an enemy.

Cryptographic methods may be used not only for 25 secrecy, but also for authentication of messages. The encryption of a message using a keyword also, in principle, includes its authenticity, since an enemy cannot produce the clear text of the message without knowledge of the keyword.

30 In an asymmetric cryptosystem, the keyword used for encryption of a message is different to that used for decryption. Such a system, with a public and a private key, is also referred to as a public key system. The best known example of the

public key system is the so-called RSA method, whose principles are likewise described in the literature above-mentioned reference mentioned initially.

At first glance, the system of key distribution is largely solved when using asymmetric cryptosystems, since the public keys can be interchanged without any problems via insecure data channels. However, this is true only provided that eavesdropping is regarded as the only risk to a communications link. However, in most cases, it is also necessary to take account of the possibility of active attacks, in addition to passive eavesdropping attempts. In this case, an active enemy introduces himself into the data link between two subscribers. Such an attack can be identified only when authentication measures are used.

15 authentication measures are used.
Ans. As The present invention is based on the object of specifying a method with which it is possible to authenticate the key devices involved in data interchange.

20 This object is achieved according to the
invention by the features specified in patent claim 1.

The invention will be described in the following text with reference to an exemplary embodiment. The following abbreviations are used in the description:

E Encryption
D Decryption
A, B, X Subscribers
AD Administrator
30 p Public key
s Secret key
PAD Signature key, corresponds to the public key
 p of the administrator AD

Z Certificate, corresponds to the public key p,
to the name and further details of a
subscriber X

S Signature

5 S(Z) Signature of the certificate Z

A The invention is based on a cryptomethod in
which all the encryption devices are equipped with a
joint public key. This public key pAD is allocated by a
trustworthy entity, a so-called administrator AD. In
10 principle, this allows any device to communicate with
any other, with the devices involved being
authenticated.

Sub A Each key device is individually assigned a
certificate Z in a manner known ^{the corresponding} ~~per se~~, in practice in
15 the form of a name for ^{the corresponding} ~~this~~ device. In addition, when
using the public key system, the certificate Z contains
the public key pX for the subscriber or user X.

According to the invention, user groups are
formed whose devices are equipped with a joint,
20 group-specific signature key pAD. This signature key
pAD is the public key pAD of the administrator AD. It
may be stored in the device itself, or may be ^{stored} in the
form of other storage means, ^{such as} ~~for example each of the~~ for example on a smart
card. Such a user group has a limited number of
25 subscribers. This limits the dissemination of the
signature key pAD.

The administrator AD can produce a signature
S(Z(X)), for a certificate Z(X) for a user X in a manner
known ^{in the art} ~~per se~~. In this case, the certificate Z(X) is
30 encrypted using the secret key sAD of the administrator
AD, according to the relationship:

$$S(Z(X)) = E(Z(X), sAD),$$

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This signature $S(Z(X))$ is likewise stored, in fixed or mobile form, ^{within} in the key device of the user X.

The secret key ^(AD, X) and the public key sAD , sX and (pAD, pX) of the administrator AD and of the subscribers X are part of the public key system ^{that} which is implemented, for example, using the RSA algorithms.

The group-specific signature key pAD and the subscriber-specific or device-specific signature $S(Z(X))$ are, for example, loaded in the key device on first initialization, in ^{an embodiment} refinement of the invention. In addition, the associated certificate $Z(X)$ is stored in the key device. These data may also be distributed to the appropriate subscriber on a smart card. Personal contact with the administrator AD, or at least a secure transmission channel to ^{the administrator} him, is required for these procedures.

For secure communication, a link is set up between the subscribers A and B, ^{that is to say} between the associated key devices. The subscriber A transmits the certificate $Z(A)$, and the signature $S(Z(A))$ to the subscriber B. The subscriber B can use the signature key pAD , ^{that is to say} the public key p of the administrator AD, ^{that is to say} to verify the authenticity of the certificate $Z(A)$, ^{that is to say} the authenticity of the subscriber A, according to the relationship:

$$D(S(Z(A)), pAD) == D(E(Z(A)), sAD), pAD) == Z(A)$$

The subscriber A checks the subscriber B in an analogous manner.

A potential attacker is external to the group, has no signature S assigned by the administrator AD, and ^{thus} can thus not set up a link to any subscriber in this group.

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In the event of theft, the corresponding devices are excluded from the user group, so that they cannot be used by an attacker. To do this, in one possible refinement of the invention, a list of approved 5 subscribers or key devices is stored in the key device. The identities of the possible key devices may be stored, with an appropriate security question being integrated in the process of setting up a link.

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